AD-A161 109 REQUIRED OPERATIONAL CAPABILITY (ROC) NUMBER LOG 21633 1/1
FOR A TRACTOR RUBB.. (U) MARINE CORPS WASHINGTON DC
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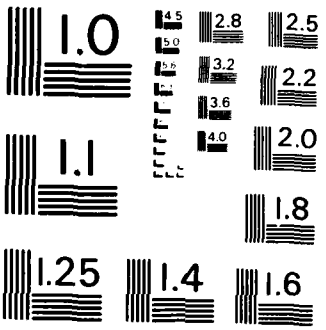

DEPARTMENT OF THE NAVY
HEADQUARTERS UNITED STATES MARINE CORPS
WASHINGTON, D.C. 20380

IN REPLY REFER TO
3900
RDD24-05-30b
21 OCT 1985

From: Commandant of the Marine Corps

Subj: REQUIRED OPERATIONAL CAPABILITY (ROC) NO. LOG 216.3.3 FOR A TRACTOR, RUBBER TIRED, ARTICULATED STEERING, MULTIPURPOSE (TRAM)

Ref: (a) MCO 3900.4C

Encl: (1) ROC No. LOG 216.3.3

1. In accordance with the procedures set forth in the reference, ROC No. LOG 216.3.3 for a Tractor, Rubber Tired, Articulated Steering, Multipurpose (TRAM) is hereby established and promulgated.

2. The Commanding General, Marine Corps Development and Education Command (Director, Development Center), Quantico, Virginia 22314 is the Marine Corps point of contact for any questions pertaining to this ROC and any development efforts pertaining thereto.

RAY "M" FRANKLIN
Major General U.S. Marine Corps
Deputy Chief of Staff for RD&S

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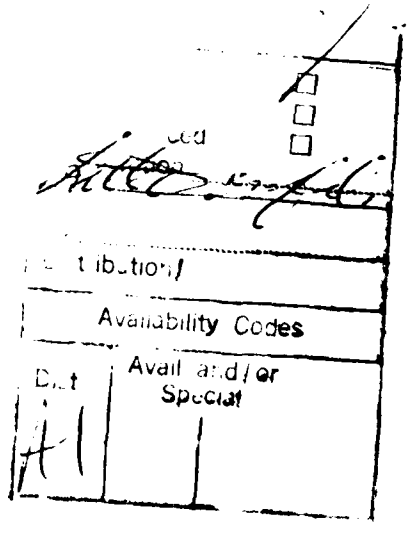

REQUIRED OPERATIONAL CAPABILITY (ROC) NO. LOG 216.3.3

TRACTOR, RUBBER TIRED, ARTICULATED STEERING, MULTIPLE PURPOSE (TRAM)

1. STATEMENT OF REQUIREMENT. The Marine Corps has a requirement for a Tractor, Rubber Tired, Articulated Steering, Multiple Purpose (TRAM) capable of operating over uneven and unprepared surfaces (rough terrain) to include sand, snow, and mud. The TRAM will be utilized by combat, combat support, and combat service support units. It will be equipped with at least a 2.0 cubic yard (heaped capacity) 4-in-1 multiple purpose bucket. In addition, a fork attachment will be available for handling cargo and supplies. A quick coupler system to satisfy the rapid exchange of attachments is required. The required initial operational capability (IOC) is FY89. The desired full operational capability (FOC) is FY92.

2. THREAT AND OPERATIONAL DEFICIENCY

a. Threat. The threat confronting the Marine Corps is outlined in the Marine Corps Long Range Plan (MLRP) of 6 June 1982 and the Marine Corps Mid-Range Objectives Plan (MMROP) of 8 November 1984. There is no specific threat which would be countered by the TRAM.

b. Operational Deficiency. The TRAM will replace the Tractor, RT, Articulated Steering, Model 72-31 MP (TAMCN: B2465) which is nearing the end of its service life and must be replaced.

3. OPERATIONAL AND ORGANIZATIONAL CONCEPTS

a. Operational Concept

(1) The TRAM must be capable of being configured primarily as a scooploader and secondarily as a forklift. In addition, the TRAM must be capable of accepting other attachments (i.e., snowblower, snowplow, brush clearer, and sweeper broom) to enhance its role as a combat multiplier.

(2) The TRAM must be capable of operating in temperatures ranging from -25 to +125° F, be capable of operating in and near salt water, and be compatible with both amphibious and commercial shipping. It is essential that the TRAM be capable of being transported by CH-53E and C-130 aircraft in single sorties.

b. Organizational Concept

(1) The TRAM will replace all of the 72-31 tractors (TAMCN B 2465) currently in the inventory. The estimated Marine Corps inventory objective for TRAM is 578, to be distributed as follows:

UNIT	TRAM
I MAF	88
II MAF	89
III MAF	92
IV DWT	88
ORF (total)	12
Gen Support Forces	21
Geo-Prepo	37
MPS	111
Depot Maintenance Float	6
PWR	34

4. ESSENTIAL CHARACTERISTICS. The TRAM is to be a commercial non-developmental item (CNDI) and will incorporate available state-of-the-art technology to increase reliability, availability, maintainability, and service life expectancy.

a. Performance Characteristics. The TRAM will:

(1) Be capable of exerting at least 20,000 pounds of breakout force as defined in SAE Standard J732C, when using the 4-in-1 multiple purpose bucket hinge pin as the pivot.

(2) Be capable of being changed from a scooploader configuration to a forklift configuration in less than two minutes using common hand tools. A quick coupler system shall be used to satisfy rapid change between attachments.

(3) Be capable of carrying up to 10,000 pounds (desired), 6,000 pounds (required), at a 48-inch load center. The maximum lift height, with rated load, shall be at least 120 inches (10 feet) at a hoist speed infinitely variable from 0 to 55 feet per minute. The minimum below ground reach shall be at least six inches.

(4) Be capable of being air transported in a single sortie by CH-53E, C-130 and larger aircraft. Removal of the front attachment, the counterweight package, the muffler/exhaust pipe extension, the roll over protective structure/falling object protective structure (ROPS/FOPS), and the cab may be required, but is not desired, to meet aircraft loading limits. Assembly/disassembly to and from this configuration shall not exceed two man-hours using available lifting devices and common tools.

(5) Have a desired curb-weight of 26,000 pounds and a required weight not to exceed 36,000 pounds. Maximum axle loads in the air transportable configuration for C-130 aircraft shall not exceed 13,000 pounds. The cab shall be of the quick removal type and the counterweights shall be configured in increments to facilitate ease of removal and installation. All removed parts must be transported with the TRAM in the same aircraft.

(6) Be hydraulically capable, with rated load, of oscillating the fork attachment at least 6 degrees to each side of center; of varying the distance between tines from 0 to 76 inches; and of shifting the forks laterally to either side of the carriage.

(7) Be equipped with service brakes capable of stopping and holding the tractor with rated load either forward or backward on a 45 percent slope. The parking brake must restrain the forklift with rated load on at least a 20 percent slope.

(8) Be capable, with rated load, of negotiating both an angle of approach and an angle of departure of at least 28 degrees; of negotiating the ramp of a landing craft at a longitudinal slope of at least 45 percent in both forward and reverse gears at a speed of not less than 2 mph; and of negotiating at least a 30 percent cross slope in full circle operation in both directions at maximum steer angle without any tire leaving the ground.

(9) Be capable, with rated load, of traversing uneven and unprepared surfaces (rough terrain) to include sand, snow, and mud and of fording at least 60 inches of salt water, including wave action, without fording kit.

(10) Be capable, with rated load, of traveling forward on flat firm ground at speeds of at least 17 mph and of executing a 360 degree turn within a curb-clearance circle of 45 feet, maximum.

(11) Have an overall height, measured to the highest point with attachment lowered, not to exceed 96 inches (8 feet), excluding Roll Over Protection System/Foreign Object Protection System (ROPS/FOPS) and cab.

(12) Have an overall width not to exceed 96 inches (8 feet), to include tire bulge.

(13) Be equipped with a 2 cubic yard (heaped) capability 4-in-1 bucket.

(14) Be equipped with fork tines that are at least 72 inches in length, not more than 2.5 inches thick, and of such width so as to enable the forks to engage pallet, shelter, and container tineways. Furthermore, the fork tines must also be compatible with the Air Force 463L pallet.

(15) Enable the operator, while seated, to observe the tine of the forks when engaging the tineways of a container or pallet. An environmentally-controlled, enclosed cab is required for extreme

climates. The cab must be capable of disassembly, and cab doors must be capable of being secured/latched in the open position. A cab-mounted rifle rack, capable of accommodating the M-16 rifle, is required to secure the operator's personal weapon. The cab must be of sufficient size to permit full mission performance by personnel (5 percent female to 95 percent male percentile) wearing the complete NBC protective ensemble, the environmental protective clothing, or the combat flack jacket.

(16) Be equipped with size 20.5 x 25 pneumatic tires with not less than a 16 ply-rating. An on-board engine driven air compressor is required for tire inflation. The tires must be capable of providing sufficient floatation to enable the TRAM, with rated load, to operate in the various beach conditions found throughout the world and from the Elevated Causeway System. The floatation index must not exceed 25 with and without rated load.

(17) Be resistant to corrosion during unprotected storage and from the effects of a salt water environment.

(18) Be capable of starting and operating in all climatic categories with ambient temperatures ranging from -25 F to +125 F, and in rain falling up to four inches per hour. It must further be capable of starting and operating in temperatures down to -50°F with the use of a winterization kit. The winterization kit will, at a minimum, consist of a personnel heater, a battery warmer, engine oil warmer, fuel preheater, window defroster, and four tire chains.

(19) Be capable of providing adequate operator-adjustable lighting for night operations.

(20) Be equipped with a 24-volt negative-ground electrical system and a NATO standard electrical slave receptacle.

(21) Be equipped with four wheel drive, a power shift-type transmission with transmission disconnect feature and diesel engine. The engine must have a cold weather starting aid. The exhaust system must be capable of mounting a spark arrestor unless turbo-charged, and will be equipped with a rain cap. The engine must be compatible with the Simplified Test Equipment - Internal Combustion Engine (STE-ICE) testing system. Design shall be such that maintenance and repair can be conducted with common tools wherever possible. No unusual mechanical skill should be required at any echelon of maintenance. Both the engine and transmission shall have an oil sample valve.

(22) Be capable of completing two missions (as described in para 4b(1)) without refueling and of accepting military standard petroleum, oil, and lubricants (POL).

(23) Have a ground clearance of at least 15 inches.

(24) Be equipped with a rear axle that can oscillate at least 7 inches above and below the horizontal axle centerline.

(25) Be equipped with integral tie-down brackets, a rear towing pintle and appropriate lifting eyes. The rear towing pintle hook shall be accessible for removal or adjustment without removing the counterweights.

(26) Be designed to meet applicable DoD human engineering, health, and safety standards and employ "user-friendly" features for personnel operating in or near the tractor throughout its life cycle. The TRAM design and engineering must allow for the certification to handle conventional and nuclear ordnance by lifting at least 1.5 times the rated load at the applicable load center without the rear wheels leaving the ground.

(27) Be capable of operation after exposure to chemical decontamination solutions and shall incorporate seals and other synthetic components that are resistant to deteriorating bacteria. Nuclear survivability is not required.

(28) Be capable of being embarked and disembarked, without disassembly, aboard all roll-on/roll-off (RO/RO) ships and amphibious shipping/craft.

(29) Be capable, under its own power, of embarking/disembarking through the surf from either the LCU or LCM-8 landing craft.

b. Reliability, Availability, and Maintainability (RAM) Characteristics

(1) The minimum acceptable value (MAV) over the life of the TRAM shall be at least 250 hours mean time between failure (MTBF) with a confidence level of 90 percent and with no more than a 0.15 maintenance ratio (MR). The expected length of a mission is 4 hours (1.8 for travel and 2.2 for lifting or scooploading). A failure is defined as any problem that prevents the machine from traveling, lifting the rated load, or excavating.

(2) The mean time to repair (MTTR) shall be not more than 1.5 hours at the organizational maintenance level and 3.0 hours at the intermediate maintenance level. The maxmimum time to repair at each of the above echelons of maintenance shall be not more than 4 and 8 hours, respectively.

(3) Scheduled preventive maintenance, except operational checks, shall be required not more often than every 50 hours. Before/during/after operational checks will be performed in accordance with the manufacturer's manual.

(4) The TRAM shall be capable of completing at least 1,500 hours of operation before replacement or rebuild of major components, such as the engine, transmission, power train, or hydraulic system.

c. Pre-planned Product Improvement. The TRAM shall be compatible with pre-planned product improvements which include the capability to support hydraulic tool operations.

5. INTRA/INTEROPFRABILITY AND STANDARDIZATION REQUIREMENTS

a. The TRAM will interface with logistics over the shore (LOTS) or similar operations. When equipped with forks, the TRAM shall be compatible with the U.S. Air Force conveyorized roller tines for handling 463L pallets at airfield departure points.

b. The TRAM will operationally interface with the movement of both conventional and nuclear ordnance when equipped with forks.

c. The TRAM will employ the NATO standard electrical slave receptacle and the Marine Corps' Simplified Test Equipment - Internal Combustion Engine (STE-ICE) testing system. The TRAM shall be compatible with existing U.S. Navy ships and lighterage for water surface movement and will primarily affect Mission Area 216 (Combat Service Support).

6. RELATED EFFORTS. The Marine Corps is the only service which requires a dual function scooploader/forklift capability from the same machine. The U.S. Army has procured the International M10A vehicle which can function as a 10,000-pound capacity forklift only, and the Case W24C scooploader. Neither vehicle meets the Marine Corps' transportability requirements.

7. TECHNICAL FEASIBILITY, COST FORECAST, AND ENERGY/ENVIRONMENT IMPACTS

a. Technical Feasibility. The TRAM is technically feasible based on commercial designs and proposals. Although technically feasible, the fording of 60 inches of salt water is not a standard commercial requirement/practice. The technical risk of fielding the TRAM is low.

b. Energy-Effectiveness Impact. The diesel engines that are designed for tractors of this type are commercially available and do not adversely impact upon the environment or upon the consumption of energy.

8. LIFE CYCLE COST FORECAST. The life cycle cost forecast and detailed estimate are attached as Appendix A. The yearly operational time for the TRAM is estimated to be 576 hours based on one 4-hour mission per day for 144 working days a year (3 days x 48 weeks = 144 working days). Life expectancy is 8 years or 4,608 hours.

9. MANPOWER REQUIREMENTS. The TRAM will be maintained within the existing maintenance structure of engineer equipment. It will be operated by properly licensed and trained Marines designated by the commander.

10. TRAINING REQUIREMENTS

a. Training Aids/Devices. None.

b. Training. Initial training for both operators and maintenance personnel will be provided by manufacturer/factory representatives. Eventually, this training will be accomplished at the appropriate military entry-level service school.

c. Manuals. Commercial operator and maintenance manuals will be utilized and supplemented by Marine Corps parts manuals (SL3, SL4).

11. AMPHIBIOUS/STRATEGIC LIFT IMPACT. Its envisioned that the new system (TRAM) will impact upon tactical and strategic mobility in the following areas:

a. The TRAM shall have a maximum weight of 26,000 pounds, which is 8,000 pounds less than the present 72-31 tractor.

b. The square foot stowage requirement is approximately the same as the 72-31 tractor.

c. The TRAM will meet C-130 and CH-53E lift and amphibious shipping requirements.

Major System: TRACTOR (TRAM) Date: 01-11-1985

LIFE CYCLE COST FORECAST

FUNDING PROFILE
(In Thousands of FY86 Constant Budget Dollars)

8 YEAR LIFE CYCLE

Major System	PRIOR YEARS	CURRENT YEAR	BUDGET YEAR	FY87	FY88	FY89	FY90	FY91	TO COMPL'N	TOTAL PROGRAM
RDT&E	0	0	107	0	0	0	0	0	0	107
PMC	0	0	0	65,086	35,542	17,846	0	0	11,850	130,325
QTYS FUNDED	0	0	0	434	237	119	0	0	0	790
Support										
PMC	0	0	0	0	0	0	0	0	824	824
MILCON	0	0	0	0	0	0	0	0	0	0
O&MMC	0	0	0	0	0	0	0	0	41,219	41,219
O&MMCR	0	0	0	0	0	0	0	0	3,621	3,621
MPMC	0	0	0	0	0	0	1,150	1,350	0	0
SPMC	0	0	0	0	0	0	0	0	0	0
NAVY PROC	0	0	0	0	0	0	0	0	0	0
TOTAL PROGRAM	0	0	107	65,086	35,542	17,846	0	0	57,513	176,095

This document should not be associated with any POM or FYDP budget document. The "To Completion" column represents the difference between the funding stream (established or proposed) and the Total Life Cycle cost column which is the life cycle cost of the program by appropriation.

Major System: TRACTOR (TRAM) Date: 01-11-1985

LIFE CYCLE COST ESTIMATE
(In Thousands of FY86 Constant Budget Dollars)

8 YEAR LIFE CYCLE

PHASE/CATEGORY		SUBCATEGORY	CATEGORY	PHASE
I.	RDT&E PHASE			107
II.	INVESTMENT PHASE			133,093
1.	SYSTEM PRODUCTION/PROCUREMENT		133,093	
A.	Major End Item (Contractor)	118,475		
B.	Initial Provisioning/Spares, Repair Parts	11,847		
C.	Government Furnished/Added Equipment	0		
D.	Other Direct System Costs	2,771		
2.	SUPPORT EQUIPMENT PROCUREMENT		0	
A.	Ammunition	0		
B.	Weapons and Tracked Combat Vehicles	0		
C.	Guided Missiles	0		
D.	Comm-Elec Equipment	0		
E.	Support Vehicles	0		
F.	Engineer and Other Equipment	0		
3.	MILITARY CONSTRUCTION		0	
III.	OPERATIONS AND SUPPORT PHASE			42,895
1.	OPERATIONS		18,392	
A.	Operator Personnel/Training	0		
B.	Material Consumption	1,064		
C.	Energy Consumption	17,329		
2.	MAINTENANCE		23,327	
A.	Organizational Maintenance	5,449		
1)	Personnel/Training	0		
2)	Maintenance Material	1,936		
3)	Repair Material	1,394		
4)	Other	2,118		
B.	Intermediate Maintenance	2,614		
1)	Personnel/Training	0		
2)	Maintenance Material	0		
3)	Repair Material	2,614		
4)	Other	0		
C.	Depot Repair	14,441		
D.	Depot Overhaul	0		
E.	Unprogrammed Losses	824		
F.	Software Maintenance	0		
3.	INDIRECT SUPT, BASE OPS & MAINT, OTHER O/H COSTS		941	
A.	Base Operations	941		
B.	Other Overhead Costs	0		
4.	SUPPORT EQUIPMENT O&S		0	
TOTAL LIFE CYCLE COSTS				176,095

O&S PHASE--Reserves				3,827
1. OPERATIONS			1,523	
A. Operator Personnel/Training		0		
B. Material Consumption		88		
C. Energy Consumption		1,435		
2. MAINTENANCE			2,069	
A. Organizational Maintenance		451		
1) Personnel/Training	0			
2) Maintenance Material	160			
3) Repair Material	115			
4) Other	175			
B. Intermediate Maintenance		216		
1) Personnel/Training	0			
2) Maintenance Material	0			
3) Repair Material	216			
4) Other	0			
C. Depot Repair		1,196		
D. Depot Overhaul		0		
E. Unprogrammed Losses		206		
F. Software Maintenance		0		
3. INDIRECT SUPT, BASE OPS & MAINT, OTHER O/H COSTS			235	
A. Base Operations		235		
B. Other Overhead Costs		0		
4. SUPPORT EQUIPMENT O&S			0	

END

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